USER MANUAL

BOOSTCAP® Energy Storage Modules

for UPS / Backup & Renewable Energy Applications

User Manual for 75V Modules:

- BMOD0094 E075 B02

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WARNING
 DANGER – HIGH VOLTAGE HAZARD! **Never touch the power terminals as the module can be charged and cause fatal electrical shocks.** **Always check that the module is fully discharged before manipulating the module.** **Please refer to the step by step instructions on page 10 for the manual discharge procedure.**

1. Introduction

The 75V energy module is a self-contained energy storage device entailing containing individual ultra capacitor cells connected together through bus bar connections. Units may be connected in series [up to 4] to obtain higher operating voltages, in parallel to provide additional energy storage, or a combination of series/parallel arrangements for higher voltages and energy. The 75V module must never be connected to other types of modules in any way. Passive balancing and thermal monitoring is incorporated into the module, the latter being accessible through a robust connector. The 75V module enclosure consists of top and bottom highly resistant ABS shells, sheet metal sides, and a thick top plate on which the Harting® monitoring connector is mounted. The enclosure is not sealed but compliant per IEC 529 - IP54 and requires no maintenance. Module temperature can be monitored by accessing the output of an internally mounted PT100 Thermistor at the Harting® connector.

2. Unpacking

Inspect the shipping box for signs of damage prior to unpacking the module. Damage to the shipping box or module should be reported to the carrier immediately.

Remove the module from the shipping box by lifting the module straight up. The 75 V module weights 25 kg and can be lifted by hand by one person.

Retain the shipping materials until the unit has been inspected and is determined to be operational. The original shipping materials are approved for both air and ground shipment. Make sure that the shipping container(s) contain(s) the following:

1) Energy Module
2) User's Manual

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If the unit is found to be defective or any parts are missing, contact Maxwell Technologies. A Return Material Authorization (RMA) number must be issued prior to returning the unit for repair or replacement.

3. Installation

3.1 Mechanical

The 75V module can be mounted in 2 orientations and requires the proper hardware to be used. The 2 supported orientations are:

- Horizontal, with connector on the top
- Vertical, on the longer side. For this orientation, the module needs to be bolted to a supporting side wall

Refer to Figure 1.1 and 1.2 below for overall module dimensions and mounting hole locations.

The mounting plate on the top of the module is designed to support attachment of the module to an electrical system or enclosure. In order to properly secure the module to a base plate, use 4 (four) screws, M6, minimum 200 mm long, allowing for a minimum of 10 mm thread engagement in the base plate. These mounting screws must be 18-8 stainless steel or stronger, torqued to a recommended 12 Nm, and must include flat washers and locking devices. Longer screws may be required if using through-holes and nuts.

NOTE: These screws are application specific and thus NOT included with the module.

The mating monitoring connector is not included in the module and can be sourced from Harting® www.harting.de.

Recommended Harting® HAN Mating Solutions:

- 1x 09 36 008 3101 mating insert
- 3x 09 15 000 622x mating pins
- 1x 09 37 003 1440 hood (heavy duty) or 1x 19 37 003 1440 hood (std)

When installing multiple modules in series or parallel configurations refer to Figure 1.1 for proper hole spacing. Leave 25mm clearance (minimum) between modules. Refer to section 3.2.1 for more electrical information on series and parallel configurations.

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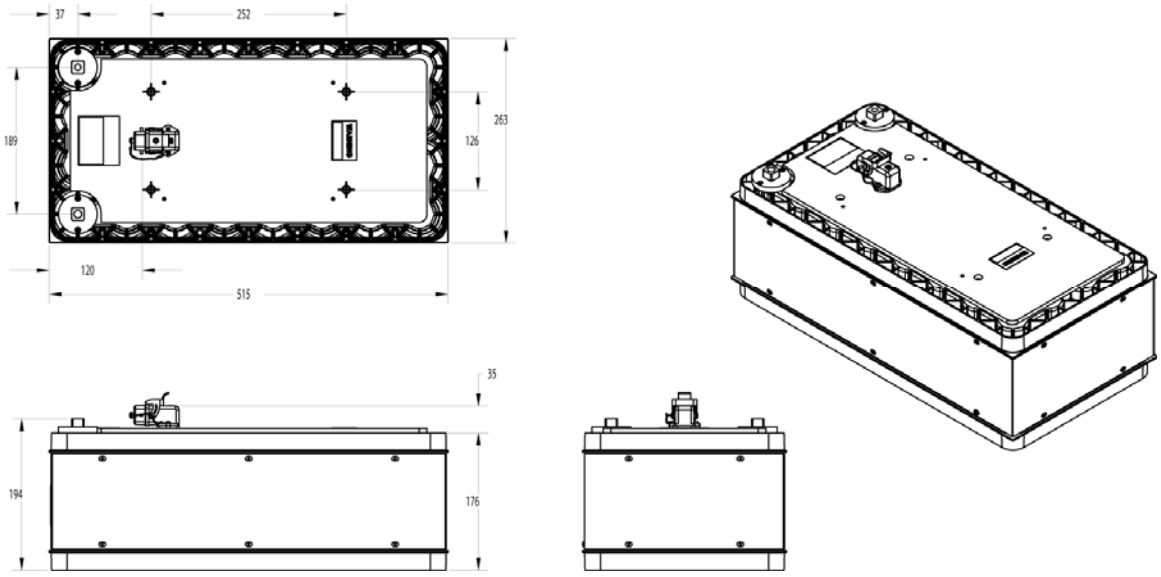

Figure 1.1 75V Module Dimensions

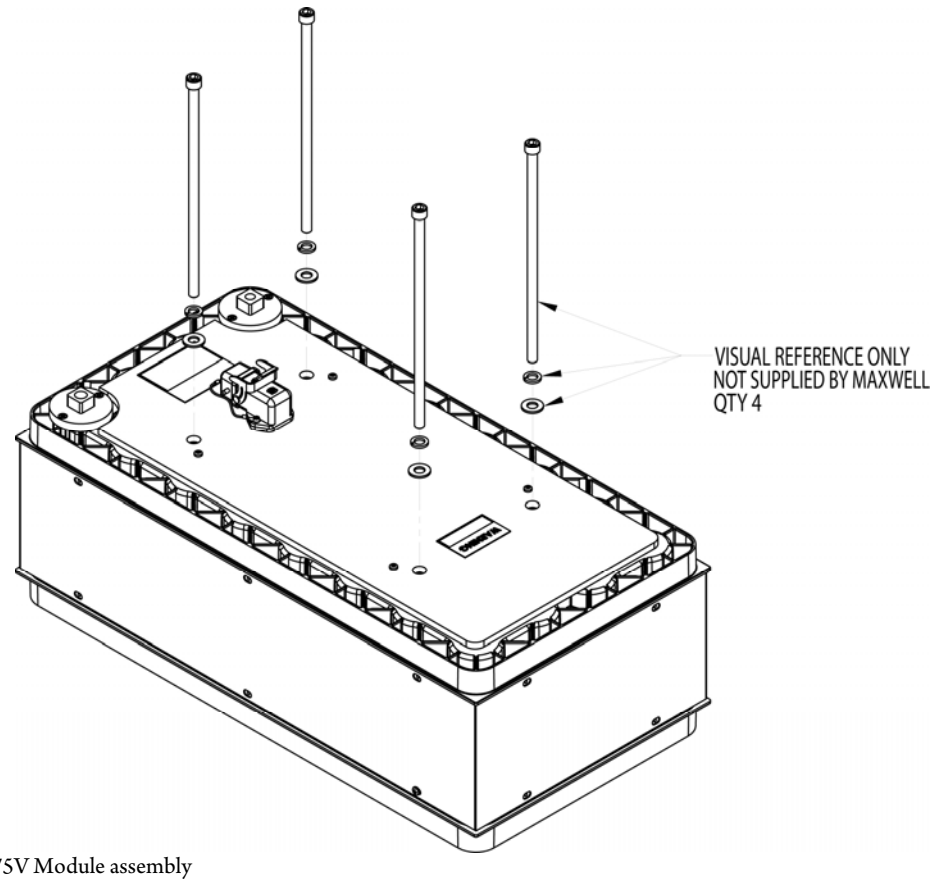

Figure 1.2 75V Module assembly

3.2 Electrical

WARNING

DANGER!

To avoid arcing and sparking the energy storage module should be in a discharged state and the system power disconnected during installation. The module is shipped discharged. The shorting wire should be removed just prior to making electrical connections.

For more information about the discharge procedure please refer to page 10.

To provide the lowest possible equivalent series resistance (ESRDC) the high power current path within the module is not fused. Care should be taken within the application to prevent excessive current flow as required. Excessive current and/or abnormal duty cycle will result in overheating the module which will cause irreparable damage. Please consult the specific data sheet for each module for current and duty cycle capabilities.

The module features a passive balancing system that consists of one 55 Ohm resistor in parallel with each cell

3.2.1 Electrical Connection

3.2.1.1 Output Terminal Posts

The output terminals of the module consist of internally threaded aluminum posts. Maximum thread depth is 15 mm. They are designed to connect directly to a ring lug or a bus bar. Apply a layer of anti-oxidant joint compound (high conductivity aluminum-aluminum. For example, Noalox® Anti-Oxidant Compound available from IDEAL is a viable choice. There are many other vendors that supply equivalent compounds) between the mating surfaces. The positive terminal is threaded for M8 x 1.25 steel bolts. The negative terminal is threaded for M10 x 1.5 steel bolts. Wave washers are required to ensure long term, reliable connections. When applying torque to the terminals it is recommended to use the maximum torque for the M8 (25Nm) and for the M10 (55Nm) bolts and for aluminum threads. Anti-rotation features within the module prevent damage of the terminals when applying torque to the bolts.

Attachment to the output terminals should be made with ring lugs or bus bars of an appropriate size for the application current. The energy storage modules have a low ESR. As a result, the resistance of the wires connecting the energy storage module to the application can easily exceed the ESR of the module.

Connection of modules in series or parallel should utilize the same gauge wire (or equivalent bus bar) as determined for final output connections. When connecting in series connect the positive output terminal of one module to the negative output terminal of the next module. When connecting in parallel connect

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the positive and negative output terminals of one module or string to the positive and negative output terminals, respectively, of the next module or string. When several modules are connected in series for operating at higher voltage, care must be taken to ensure proper creepage and clearance distances in compliance with national safety standards for electrical equipment.

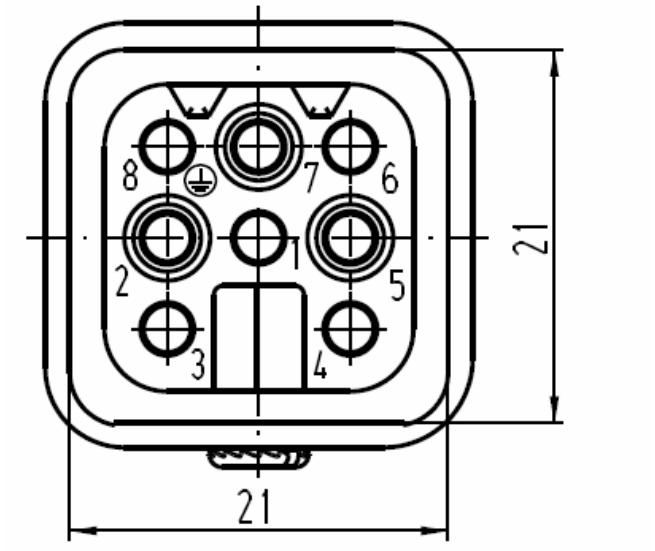
When connecting modules in combination of series and parallel, the series strings should be interconnected first. The parallel connections will be made at the end points of the series string at the negative-to-negative and positive-to-positive terminal posts.

Up to 4x 75 V modules may be connected in series for high voltage applications. This corresponds to a maximum system voltage of 300 VDC. Isolation of the modules is tested to 1600 VDC. The modules should not be used in higher voltage environments.

The terminal cover caps are cable specific and are not included with this product. It is recommended to install these cover caps to provide adequate isolation at the terminal level

3.2.2 Monitor Connection

A single, 8-pin connector on the front panel of the 75 energy modules carries signals for temperature monitoring. Figure 1.3 shows the pin assignment on the 8-pin connector for the 75 V modules.



Pin	Description
1	N/A
2	N/A
3	Thermistor lead 1 or 2
4	Thermistor lead 2 or 1
5	N/A
6	N/A
7	N/A
8	N/A

Figure 1.3: Pin assignment for 8-pin Monitor Connector – 75 V Module

3.2.2.1 Temperature Monitoring

The 75V module uses a temperature sensor within the module at a location which is representative of the cell population temperature.

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The temperature output is via a PT100 thermistor. The resistance of the thermistor varies with temperature to provide actual temperature of the module. The resistance measured through the thermistor relates to temperature according to the temperature chart in table 1.4 for the Minco resistance S17624PDYT20B (EN60751, Class B, 100 Ohm @ 0ºC) http://www.minco.com.

Temp °C	0	-1	-2	-3	-4	-5	-6	-7	-8	-9
-40	84.2707									
-30	88.2217	87.8271	87.4325	87.0377	86.6428	86.2478	85.8526	85.4573	85.0619	84.6663
-20	92.1599	91.7666	91.3732	90.9797	90.5861	90.1923	89.7985	89.4044	89.0103	88.6160
-10	96.0859	95.6938	95.3016	94.9093	94.5169	94.1244	93.7317	93.3390	92.9461	92.5530
0	100.000	99.6091	99.2181	98.8270	98.4358	98.0444	97.6529	97.2613	96.8696	96.4778
Temp °C	**0**	**+1**	**+2**	**+3**	**+4**	**+5**	**+6**	**+7**	**+8**	**+9**
0	100.000	100.3908	100.7814	101.1720	101.5624	101.9527	102.3429	102.7330	103.1229	103.5128
10	103.9025	104.2921	104.6816	105.0710	105.4603	105.8495	106.2385	106.6274	107.0162	107.4049
20	107.7935	108.1820	108.5703	108.9585	109.3467	109.7347	110.1225	110.5103	110.8980	111.2855
30	111.6729	112.0602	112.4474	112.8345	113.2215	113.6083	113.9950	114.3817	114.7681	115.1545
40	115.5408	115.9270	116.3130	116.6989	117.0847	117.4704	117.8560	118.2414	118.6268	119.0120
50	119.3971	119.7821	120.1670	120.5518	120.9364	121.3210	121.7054	122.0897	122.4739	122.8579
60	123.2419	123.6257	124.0095	124.3931	124.7766	125.1600	125.5432	125.9264	126.3094	126.6923
70	127.0751									

Table 1.4 Thermistor function diagram for the 75 V Module

4. Thermal Performance

Low internal resistance of the energy storage modules results in relatively low internal heat generation within the modules during use. However, the module is design for UPS/backup energy operations **only** and **not** for high duty cycle operations. Sufficient time needs to be allowed between cycles, depending on operating voltage, current, outdoor and module temperatures. For this reason, it is very important to monitor the module temperature through the monitoring connector.

5. Accessories

There are no accessories available for this product.

6. Operation

The 75V module should only be operated within specified voltage and temperature ratings. Determine whether current limiting is necessary on input/output based on current ratings of ancillary devices. Observe polarity indicated on module.

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7. Safety

WARNING
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Do not operate unit above specified voltage.

Do not operate unit above specified temperature rating.

Do not touch terminals with conductors while charged. Serious burns, shock, or material fusing may occur.

Protect surrounding electrical components from incidental contact.

Provide sufficient electrical isolation when working above 50 V DC.

Prior to installation on and removal from the equipment, it is mandatory to fully discharge the module to guarantee the safety of all personnel.

Please proceed as follow to discharge the module:

1) Using a voltmeter, measure the voltage between the 2 terminals.

2) If the voltage is above 2V, you will need to connect a resistor pack (not supplied with the module) between the terminals. Proper care needs to be taken in the design and construction of such a dissipative pack. *E.g. At 75V, for a 2 Ohm pack, the module will be discharged with a current of 37.5A and will take 10-15 minutes to fully discharge. However, in this case, the heat/power dissipated in the resistor pack will be ~ 1.4kW. The resistor pack will need to be sized and provided with suitable cooling to handle this power dissipation. Additionally, proper enclosure or other packaging is necessary to ensure safety. In all cases, proper design of the dissipative resistor pack is necessary.*

3) If the voltage is under 2V, the module is now considered safe for manipulation. However due to the low internal series resistance high current can flow if the terminals are short circuited. Therefore specific care should still be taken.

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8. Maintenance

Prior to removal from the cable removal, or any other handling, ensure that the energy storage module is completely discharged in a safe manner. The stored energy and the voltage levels may be lethal if mishandling occurs.

9. Storage

The module can be stored in the original package, discharged, in a dry place. Observe the maximum storage temperature as stated in the specifications. Discharge used module prior to stock or shipment.

10. Disposal

Do not dispose of module in trash. Dispose of according to local regulations.

11. Specifications

Refer to data sheets for specifications for each specific product.

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